KU — University of Kansas, Museum of Natural History, U.S.A.
MSU — Michigan State University Museum, East Lancing, U.S.A.
SKD — S. K. Dutta's collection.
USNM — United States National Museum, Washington, D.C., U.S.A.

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30. BIO-ECOLOGICAL OBSERVATIONS ON *TOR CHILINOIDES* (McCLELLAND)

Tor chilinoides occurs abundantly in the hill streams of Garhwal and is well adapted to the rapid flowing waters. A dark coloured Mahseer, which does not grow to a large size as other species of the genus (*Tor putitora, T. tor, T. mosal* and *T. khudree* etc), it is consumed as food in large quantities in the hills.

A bottom dwelling fish, it is found in deep pools beneath rocks and stones covered with algal slime preferring a stony substratum for its life activities. The depressed and slender body is suitable for the bottom living habit of the fish as also the reduction of the scales on the thorax and abdomen, and horizontally placed paired fins. The fish is very active in its movements and is a schooling fish.

Food and feeding habits:

A column as well as bottom feeder, it is omnivorous. The gut contents included diatoms (*Cymbella, Fragilaria, Navicula, Nitzschia, Synedra*), algae (*Cladophora, Chara, Hydrodictyon, Oedogonium, Pithophora, Gleotrichia, Rivularia*), macrophytes (*Equisetum, Potamogeton* and *Polygonum*), annelids, nematodes, crustaceans and insects (nymphs of Ephemeroptera such as *Baetis, Epeorus, Ephemerella, Heptagenia;* Odonata of the genera *Ictinogomphus, Lestes, Brachydiplax*; Plecoptera of the genera *Perla, Neoperla, Nemoura* and larvae of Trichoptera of genera *Philopotamus* and *Rhyacophila*; Diptera of genera *Blepharocerid, Chironomus, Simulium* and Coleoptera of the genus *Psephenus* etc. Some specimens had skull and other bones of frogs and chitinous body parts of crabs.

Diatoms are found in abundance from October to March and in reduced quantity from April to August. Algae are in abundance during January, March, May and December. The macrophytes are of rare occurrence. It has been observed that insects (their larvae and nymphs) are found in lesser number during December and July and in high numbers during October, November, March, April, May and June. Spawning starvation was observed in this fish; after spawning, the fish feeds voraciously.

Feeds by scraping off algae, diatoms, insects (their larvae and nymphs) from the rocks and stones at the bottom. The lips are thick and hypertrophied and are the main feeding organs. In some populations of fishes which are found in fast flowing streams, there are much enlarged upper and lower horny jaws and it is supposed that these help the fish in scraping and scooping the diatoms, algae, insects (their larvae and nymphs) from the rocks and stones below the waterfalls.

The length of the alimentary canal in the size range of 121 mm to 248 mm total length was found to range between 150 mm and 410 mm and the relative length of the gut ranges between 1.239 and 2.803 times the total length. The size of the gut indicates that the fish is omnivorous.

Sexual dimorphism:

The male and the female can be distinguished easily by the following characters:

1. The snout is pointed and tuberculated in the male while it is not so in the female.
2. In the male, the lips are fleshy and the lower lip is produced backwards into a fleshy labial fold. In the female, on the other hand, the lips are not much thick and the lower lip is not produced into a fleshy labial fold.
3. The anal fin does not reach beyond the base of the caudal fin in the male, while it does so in the female.
4. The mature males are lighter in weight and their ventral profile is straight. The females are heavier with enlarged and distended abdomen.

Breeding period and behaviour:

A monsoon breeder, the fish move upstream in search of shallow spawning pools during the breeding season. Generally, spawning takes place during rainy days. The fish spawns several times during the breeding season. The ripe ovary contains ova in different stages of maturity. Ripe fishes are found abundantly during May and June. The fry make their appearance first in July and are found till September. Appearance of fry during this period further confirms the breeding period of the fish. In the fry, there are two black spots on each scale of the lateral line. A black spot is also present at the base of the caudal fin. The minimum size at first maturity for female is 120 mm and for male 64 mm.

The diameter of mature ova ranges between 1.527-2.956 mm. The fecundity of the fish in the size range 120-207 mm total length was found to range between 952 and 3628.

Hydrological studies indicate that the temperature tolerance of this species ranged from 5°C to 25°C. *T. chilinoides* breeds in the monsoon season when water temperature ranges from 18°C to 25°C. This is the season when the water temperature remains almost constant. The species occurs in waters where concentration of dissolved oxygen ranges from 8.2 ppm to 24.6 ppm and pH 7.0 to 8.3. These hill streams and rivers are clear throughout the year except during the rainy season when they become turbid. Tolerance for low water temperature, neutral and alkaline pH, high concentration of dissolved oxygen and clarity of water are the main factors governing the abundance of *T. chilinoides* in hill streams. The range of free carbon dioxide is 0.1 to 5.4 ppm in these hill streams which is extremely low and such quantity of carbon dioxide does not affect the life of the fish in any manner.

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RAJ TILAK
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31. RECORD OF THE MONSTER CRICKET *SCHIZODACTYLUS MONSTROUS* DRURY FROM JAMMU (J. & K.), INDIA

On 2 October, 1978 numerous holes of more or less uniform size and diameter were seen on the wet as well as semi-wet sandy river bank adjacent to the water of the river Basantar near Samba, Jammu. A few such holes were dug out carefully and the insects collected were identified as the monster cricket, *Schizodactylus monstrous* Drury, 1873.

The holes on wet and semi-wet sand on the bank are found within a distance of 3-5 m from the water. The vertical depth was 10-15 cm and the tunnel then ran longitudinally for 25-30 cm to a blind end where the insect was found.

These insects avoid direct light, sun rays and dry wind. In water they swim quite efficiently, near the bank and into deep water.

Lefroy and Howlett (1971) gave its distribution as "Tirhoot, parts of Assam, Bellary, parts of Sind and Multan (Pakistan)". This